FITTING CLEAR440

INTRODUCTION TO THIS MANUAL

The WIDEX CLEAR™440 hearing aid is fitted using Compass V5.0 or later versions. In this manual you will find all relevant information regarding fitting CLEAR440 and DEX and using the new tools available with Compass 5.0 and later.

The manual is divided into chapters, each describing areas important for fitting CLEAR440 – wireless options, fine-tuning options, new program options, additional options and changes in the rationale behind the fitting.

In each chapter different functionalities are described with reference to their audiological and technical background as well as their performance and usage.

Seven supplementary quick guides have also been produced for quick reference to vital CLEAR440 and DEX fitting procedures.

THE FOLLOWING SECTION PROVIDES AN **OVERVIEW** OF THE **VARIOUS CHAPTERS** IN THIS **MANUAL**.

Chapter 1: **CLEAR440 – wireless options** – Page 4

In this chapter, the use of wireless fitting without fitting cables is described in detail, introducing the nEARcom as well as the USB Link option. This chapter also focuses on the audiological background of the new InterEar features available with CLEAR440, describing the concept of the InterEar Speech Enhancer, InterEar TruSound Compression and several other InterEar features.

With CLEAR440 a range of DEX accessories is also available, and this chapter describes the functionality and fitting procedure for the different DEX accessories.

Chapter 2: **CLEAR440 – New fine-tuning options** – Page 13

Hearing aid fine tuning is dependent on the hearing aid user's experience with the hearing aids in various listening situations. With CLEAR440, a range of new fine-tuning tools is available for the hearing care professional. To achieve the optimum opportunities when fine tuning gain, a 15 channel gain settings panel is introduced. New options are also available when working with acclimatisation and the new audiological features in CLEAR440.

Chapter 3: **New program options with CLEAR440** – Page 24

CLEAR440 offers a range of new program options, ensuring a wider choice for the hearing care professional when working to secure optimal use of CLEAR440 hearing aids in all listening situations. With InterEar Zen, new options are available when fine-tuning a Zen program.

Chapter 4: **Additional options when fitting CLEAR440** – Page 31

To support the hearing care professional in the fine-tuning session, the Solution guide has been refined with CLEAR440. Fitting CLEAR440 binaurally will offer the client a range of InterEar functionalities, and two CLEAR440 hearing aids fitted together will automatically include these options. Some clients are originally only fitted monaurally, but will later want to start using binaurally fitted hearing aids. The process of establishing a pair of CLEAR440 hearing aids is supported by Compass to make it easy and intuitive to the hearing care professional.

Other options mentioned in this chapter are the Service Reminder and how to protect the fitting using a safety code in Compass.

Chapter 5: **Rationale changes affecting the fitting** – Page 37

Assessment of in-situ acoustics (AISA) is a concept used in the fitting of Widex hearing aids to ensure fitting precision. AISA is continuously developed, and the final chapter explains the reasoning behind AISA III. More information on AISA can be found in WidexPress 24.

CHAPTER 1:
CLEAR440 – WIRELESS OPTIONS

WIRELESS **FITTING**

Fitting CLEAR440 hearing aids is as simple and easy as fitting any other Widex hearing aid. The illustrative and intuitive Compass software will guide the hearing care professional throughout the fitting procedure as well as subsequent fine-tuning sessions and counselling.

Like for all other Widex hearing aids, performing five basic fitting steps will ensure an optimum fitting for every client:

• Pre-fitting considerations based on client info and possibly individual data measurements like in-situ RECD
• Performing the Sensogram
• Performing the feedback test
• Setting hearing aid options according to client wishes and needs
• Administer post fitting counselling and possible fine tuning

With CLEAR440 the practical implications of fitting the client have been drastically improved. Introducing Wireless fitting, the hearing care professional no longer has to concern themselves with the physical cable connection between the fitting software and the hearing aids. This connection is now established wirelessly to the benefit of both the hearing care professional and the client.

Without the need for cables and connecting adaptors, CLEAR440 can be fitted using only a wireless connection established with the appropriate hardware - the nEARcom.

When using the nEARcom hardware, other hearing aid products from both Widex and other manufacturers can be fitted using cables connected directly to the nEARcom.

Wireless fitting
• Hassle-free fitting method for both the hearing care professional and the client.
• A choice between involving the client in the initial detection procedure and performing the procedure without involving the client.
• Wireless fitting with industry standard hardware – the nEARcom - which also supports fitting with cables.

WIRELESS **DETECTION**

All CLEAR440 and more recent hearing aids with wireless technology from Widex are always fitted wirelessly using the WidexLink technology to establish the connection to the hearing aids.

With the fitting software (Compass V5 or a later version) the hearing care professional is guided through the important steps of detecting the hearing aids chosen for the client and establishing the connection for both the right and left hearing aid.

This can be done by the hearing care professional before the client's visit or together with the client as the first thing in the fitting session. Each hearing care professional will have their own preferences as to which method to use, but may also base the decision on information about their client.

• Involving the client in the detection procedure can be an advantage when the client is able to co-operate. When hearing the sound to identify the hearing aid, the client must indicate whether the hearing aid is left or right.
• Performing the detection procedure before meeting the client can be an advantage when the client is not able to co-operate, for example if they are hard of hearing or the client is a child.

PERFORMING A WIRELESS FITTING

Performing a wireless fitting requires Compass V5, hearing aids with wireless technology from Widex and the nEARcom with a Widex Tech Module.

To get it right from the start with wireless fitting you connect NOAHlink to the nEARcom and choose the nEARcom as Interface in the Setup menu in Compass.

It is also recommended that the hearing care professional colour-mark BTE hearing aids to identify left and right. You are now ready to perform the detection procedure in Compass.

Detection procedure
To detect the hearing aids in Compass, the hearing care professional has to place the nEARcom either on a table or around the client's neck. The Detection guide describes both methods.

Fig. 1: The detection procedure with the nEARcom on a table.

When the hearing aids have been placed in the middle of the neck loop or on the client's ear, the hearing care professional is ready to start the detection procedure. Please follow the quick guide and learn how easy this procedure is. When the hearing aids are detected and identified, the hearing care professional can proceed with the fitting process in Compass as usual.

Detect hearing aids as follows:
1. To identify hearing aids, make sure they are placed in the middle of the nEARcom neck loop and then use the Play buttons under Identify HA. When you select a Play button, the relevant hearing aid plays a sound for 6 seconds and in some models a light-emitting diode lights up.

2. While this is happening, remove the hearing aid from the nEARcom and listen to it.

3. In Compass, select whether the hearing aid is for the left or right ear.

4. Repeat the procedure if you are fitting two hearing aids.

5. Click Next to connect the hearing aids.

6. Select a starting point and make sure the acoustic identity is correct.

7. Position the hearing aids in the client's ears and the nEARcom around the neck of the client.

USB Link

With the new WidexLink wireless technology, Widex also introduces a new hardware concept in fitting – the Widex USB Link.

Using the Widex USB Link enables fitting of CLEAR440 hearing aids using an intuitive and easy hardware solution without the need for NOAHlink. The Widex USB Link has a standard USB plug and connects directly to the fitting computer.

For those hearing care professionals who are not familiar with the use of NOAHlink as fitting interface, the Widex USB Link is an easy alternative when fitting Widex wireless hearing aids.

Fig. 2: The detection procedure with the Widex USB Link.

The detection procedure is the same as with the nEARcom. The hearing care professional just has to choose the Widex USB Link as interface in the Setup menu in Compass.

CLEAR440 - **DESIGNED** TO **COORDINATE** AND **SYNCHRONISE**

It is well known that one of the major difficulties for people with hearing loss is to determine the direction of a sound source. Using two hearing aids fitted in a balanced matter has up till now been the preferred suggestion on how to eliminate this problem. The C-ISP platform supporting the CLEAR440 hearing aids supports the coordination and synchronisation of important features relevant for precisely this task.

WidexLink – accurate and frequent data transmission

WidexLink

Due to the accurate and very frequent data transmission between two CLEAR440 hearing aids, important cues for preserving a more natural perception of the environment are supported. This includes the coordination of compression and speech enhancement, as well as volume and program synchronisation.

InterEar TruSound compression - Coordination of compression

By coordinating the compressors of two CLEAR440 hearing aids the important Interaural Level Difference (ILD) is preserved. The ILD is used by the brain to place sound sources correctly in the horizontal plane. The Interaural Level Difference arises because of the shadow effect of the human ear. For a normal hearing listener, the level of a sound reaching the right ear will be higher at the right eardrum than at the left eardrum because of the head shadow effect. Coordinating the compressors of two hearing aids with InterEar TruSound compression allows the normal ILD to be maintained.
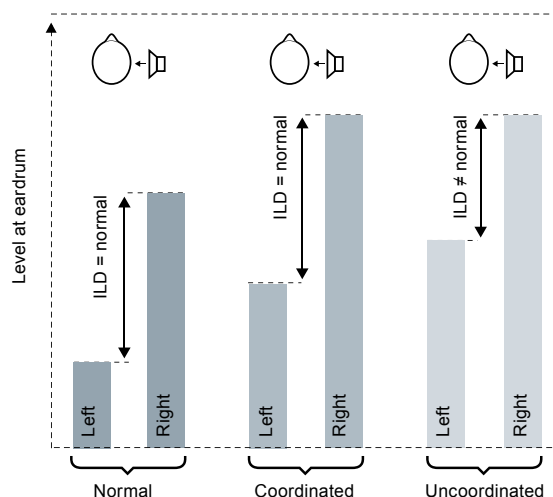

Fig. 3: Displaying the ILD without hearing aids (normal), with uncoordinated hearing aids and with coordinated hearing aids.

InterEar Speech Enhancer

The Speech Enhancer in CLEAR440 is continuously coordinated to support the hearing impaired client's ability to direct focus to a speaker speaking from the side of the listener. This could be of great importance in a noisy environment. See Fig. 4.

When working as a coordinated feature, the Speech Enhancer will have access to knowledge on the location of the dominant speaker, allowing it to activate a fast acting gain mechanism that supplies extra gain in speech important frequency areas to support best possible speech intelligibility.

In a CLEAR440 fitting, the coordination of compression and speech enhancement is a default feature setting for best possible utilisation of the wireless possibilities of CLEAR440.

Supporting coordinated sound processing

Maintaining coordinated sound processing between two hearing aids in real life situations is one of the main scopes of CLEAR440 hearing aids. But inappropriate use of the volume control and program shift can interfere with this coordination. CLEAR440 therefore introduces Volume Sync and Program Sync to support the coordination of sound processing. A pair of CLEAR440 hearing aids fitted with coordinating features will this way continue to work as intended, also in daily life. Changing volume on one hearing aid means same volume change on the other hearing aid. Changing program on one hearing aid means also changing program on the other hearing aid.

Further possibilities with WidexLink

With the accurate and frequent data transmission obtained with WidexLink, coordination of other CLEAR440 features is also an option. Using an extra set of data, a pair of CLEAR440 hearing aids are able to determine the presence of feedback and take action to actively cancel a feedback signal. When fitting CLEAR440 hearing aids, this coordination is enabled by default to manage feedback as efficiently as possible.
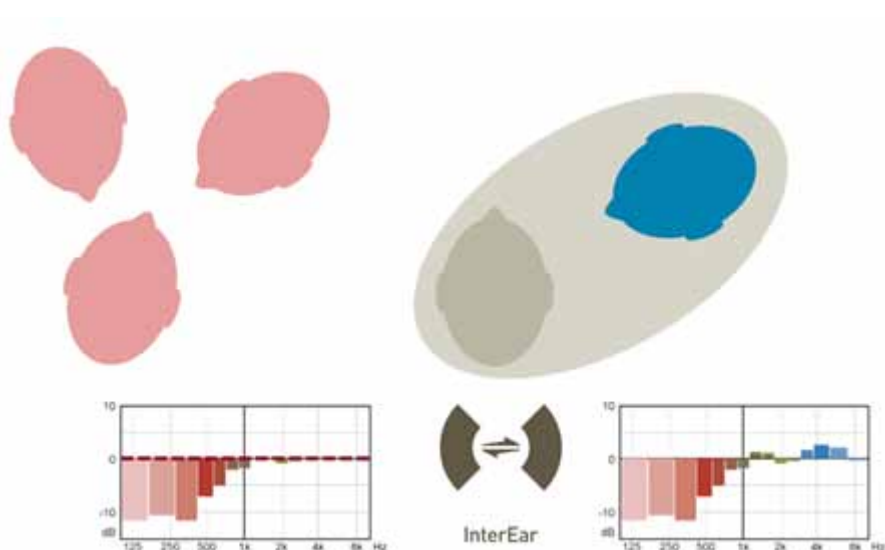

Fig. 4: The InterEar Speech Enhancer works as a coordinated feature and supports the ability to direct focus to the dominant speaker.

InterEar Zen

For clients using the Zen feature WidexLink offers a unique possibility of distributing the Zen tones over two hearing aids. In a pair of CLEAR440 hearing aids, each Zen style will by default be chosen to be the same on both hearing aids and the tones in each individual style will be distributed over the two hearing aids to create a stereo-like effect.
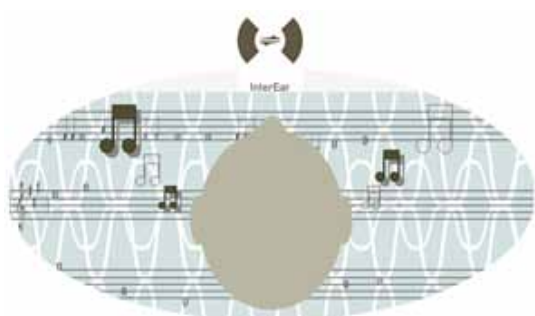
The InterEar partner monitor

CLEAR440 features the InterEar partner monitor – allowing a lost partner alarm to be activated whenever the connection between two CLEAR440 hearing aids is lost. If the user loses his hearing aid, for instance on the golf course, the InterEar partner monitor that surveys the coupling between the two hearing aids will alert the user by means of the SmartSpeak message "Partner Check". Simultaneously a LED in the two hearing aids will start flashing[1].

The lost partner alarm can be activated under Acoustic indicators in the HA configuration window under Finalise.

Adjusting InterEar functionalities

The InterEar functionalities are by default enabled in binaural fittings. If needed, the functionalities can be disabled in the InterEar configuration panel. See Fig. 5.

Some of the InterEar functionalities are linked to each other. If you disable Program selection, please be aware that Compression, Noise reduction, Feedback cancelling, and Zen are disabled too.

The hearing care professional can activate the Lost partner function under Acoustic indicators.

Please notice that the InterEar icons in the Fine tuning window do not indicate whether the functionalities are activated or not. See Fig. 6
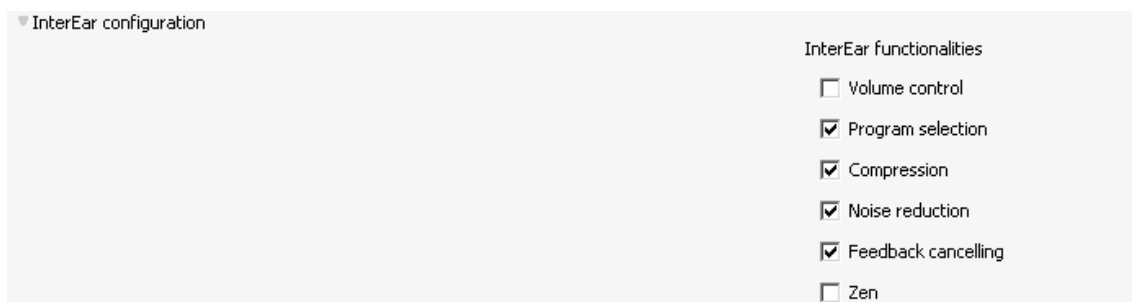

Fig. 5: The InterEar functionalities are found under Finalise and HA configuration.
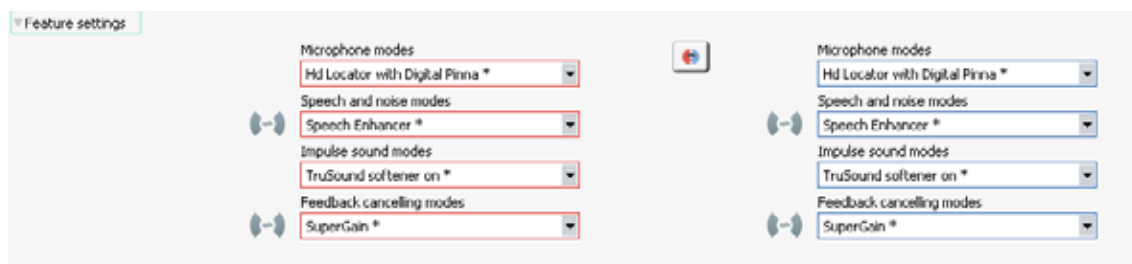

Fig. 6: The InterEar icons indicate the association between the InterEar functionalities and the feature.

DEX ACCESSORIES

With CLEAR440, a new product concept from Widex is introduced – the DEX.

RC-DEX: compact remote control
TV-DEX: for TV-viewing
M-DEX: for mobile phone use and
         advanced remote control

For people with hearing loss, situations like watching TV, talking in a mobile phone or listening to sound from, for instance, the computer can be difficult despite appropriately fitted hearing aids, and many therefore choose to use assistive listening devices.

With assistive listening devices like teleloop systems or other systems able to transmit audio from an external sound source and into hearing aids, the importance of sound quality must not be overlooked. Sound quality will be reflected not only in the bandwidth of the transmitted signal but also in whether or not the signal is transmitted in stereo and if the signal transmission is delayed compared to a direct signal.

Teleloop systems are bandwidth restricted to approximately 5 kHz and sound is transmitted in mono. For other transmitting systems based on digital wireless transmission, bandwidth varies and the signal is most often transmitted in mono. Furthermore, many of such systems introduce a delay to the transmitted signal resulting in reduced sound quality, for example hollow sound or echoes.

With DEX Widex introduces a product concept targeted at specific situations. An M-DEX for mobile phone use; with options for receiving

calls, ending calls and controlling volume and programs, a TV-DEX for the TV situation - transmitting sound EchoFree™ in the bandwidth from 100 Hz to 11 kHz[2] and in stereo. Furthermore the RC-DEX is introduced – a compact dedicated remote control with access to program toggle and volume control.

DEX – reflecting user requirements
The DEX products are designed to meet two fundamental user requirements:

• Ease of use
• High sound quality

The main purpose of the DEX products is to make the user interface easy and intuitive – by minimising confusion and time on the learning curve. An aim is that the DEX devices should react in a manner that is predictable as well as understandable for the user.

RC-DEX

Due to its compact and small size, the RC-DEX is easy to carry in a pocket. Young people or people in active employment may find the RC-DEX discreet to use.

The RC-DEX is a user-friendly remote control for adjusting volume or changing programs. The keys are easy to manipulate, making allowance for users with reduced dexterity.

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[2] *Model dependent*

TV-DEX

To offer the user a superb sound quality, the infra-red light and telecoil are now replaced by the TV-DEX. The TV-DEX caters for users who are dependent on assistive listening devices and 'just' want to watch TV without any effort. The high sound quality may appeal to the critical hearing aid user.

The TV-DEX is built for enjoying TV and audio. This DEX device aims to answer hearing aid users' complaints of not being able to hear the TV - and their nearest relations' complaints of the TV being too loud.

The TV-DEX Controller features a Room Off key, which mutes the hearing aid microphones. Room Off allows the hearing aid user to shut off any disturbing sounds in the room while enjoying TV or audio.

When Room Off is not activated, the audio signal is still transmitted directly to the hearing aids. At the same time the hearing aid microphones are activated allowing the user to follow a conversation while listening to the audio signal. Widex EchoFree technology makes sure that the user does not experience delays, distortion or echoes while the audio is being transmitted and the hearing aid microphone is activated.

The M-DEX

For those users who enjoy music, the M-DEX allows input from personal audio devices like MP3 players.

The M-DEX offers users connectivity between their hearing aids and mobile phones.

This device aims to meet the challenge of talking in mobile phones with personal hearing aids by transmitting the signal from the mobile phone directly to the hearing aids. The Room Off function allows the user to focus on the telephone conversation without being disturbed by surrounding sounds picked up by the hearing aid microphones.

M-DEX also goes a convenient step further for users of Widex hearing aids with the FreeFocus feature. FreeFocus allows users to hear in selected directions, such as passengers behind them when driving. M-DEX lets users choose right/left/front/rear focus to optimise speech intelligibility in situations where the user is unable to turn towards the speaker.

Matching DEX

In the Matching status window, the hearing care professional chooses which DEX devices he wishes to match. It is possible to see an animation of the matching procedure. The matching procedure begins when you click Start matching and you just have to follow the matching wizard. See Fig. 7.

Changing the volume control step size

It is possible to set the volume control to smaller or larger increments via the RC-DEX as well as the M-DEX. This is done in the HA configuration window in Compass. Please see 'Definable volume control' below.

Fig. 7: The DEX matching tool is found under Finalise in the left menu in Compass.

CHAPTER 2:
CLEAR440 – NEW FINE-TUNING OPTIONS

15 CHANNEL **GAIN SETTINGS MATRIX**

Fine tuning CLEAR440 – new tools for the hearing care professional
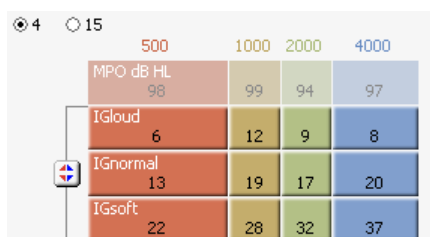
A major part of a successful hearing aid fitting is the possibility of meeting client wishes in the fine-tuning session. Several generations of Widex high end products have featured sound processing in 15 channels and the ability to measure Sensogram in expanded mode to reflect the hearing threshold in more discrete frequencies. This has formed the basis for very precise hearing aid fittings and client satisfaction. Fine-tuning multi channel hearing aids is a matter of being able to influence the performance of the sound processing with respect to both input level and frequency while also taking into account client background in terms of hearing aid usage in the past.

The competent hearing care professional performs fine tuning based on the client's wishes but also on their professional knowledge as to how features such as acclimatisation will influence client satisfaction, how adaptive features influence the sound processing of the hearing aid as well as knowledge on how counselling the client will affect fine-tuning wishes.

Fine-tuning gain settings in CLEAR440

For the situations where fine tuning is warranted and necessary, the hearing care professional needs a set of tools that will allow him to fine tune gain for specific input levels and frequency regions as well as adjust feature settings, acclimatisation and other program specific options.

By default, Widex high end hearing aids can be fine-tuned in four basic channels; 500, 1000, 2000 and 4000 Hz. Fine-tuning gain in these anchor channels means that gain in neighbouring channels will also be adjusted by interpolation and extrapolation.

Fig. 8: Basic gain settings panel – four channels.

For these basic channels, fine tuning is possible for soft, normal and loud input levels. Together with the parameters of Loudness master and gain settings for loud sounds and soft sounds, the default gain settings panel meets the needs of many fine-tuning situations in the clinic.

Some clients have specific fine-tuning needs not met by the default gain settings panel. In such cases performing the expanded Sensogram will allow Compass detailed information about the hearing threshold. In the fine-tuning session the hearing care professional will now have access to fine-tuning gain discretely in 15 channels. Compass features a new expanded gain settings panel for setting gain in 15 discrete channels and adjusting overall loudness.

Fig. 9: Expanded gain settings panel – 15 channels.

OPTIONS WITH THE 15 CHANNEL GAIN SETTINGS PANEL

Discrete fine tuning of gain

The expanded Sensogram has long been an option in Compass ensuring even more precision in the fitting of Widex hearing aids. In some cases complaints regarding the initial fitting can be resolved just by performing an expanded Sensogram and allowing this to be the basis for the fitting.

With the ability to fine-tune gain discretely in 15 channels, special fine-tuning needs can be met complementing the performance of the expanded Sensogram.

The expanded Sensogram below shows that the hearing threshold drops at 6 kHz. Therefore, more gain is introduced specifically in this channel as seen in the gain settings panel. The hearing care professional has the option of further fine-tuning the gain specifically in this channel.
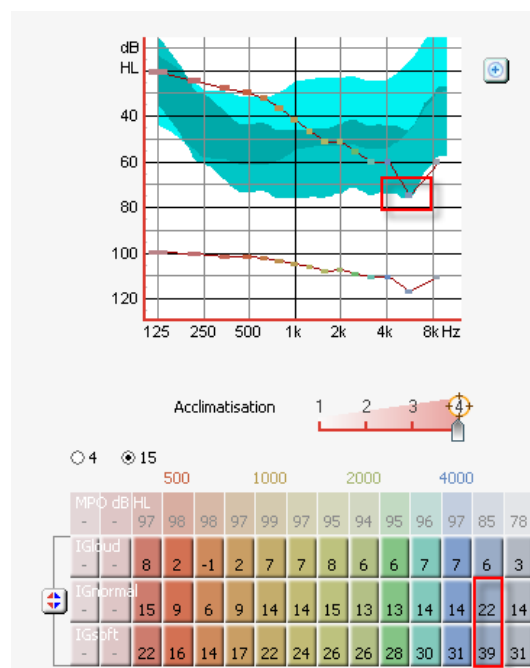
Fig. 10: Hearing threshold drops at 6 kHz and as a result, the gain for this channel is higher.

When gain is adjusted using the 15 channel gain settings panel, the adjustment will influence this channel only, allowing very specific gain adjustments to be made.
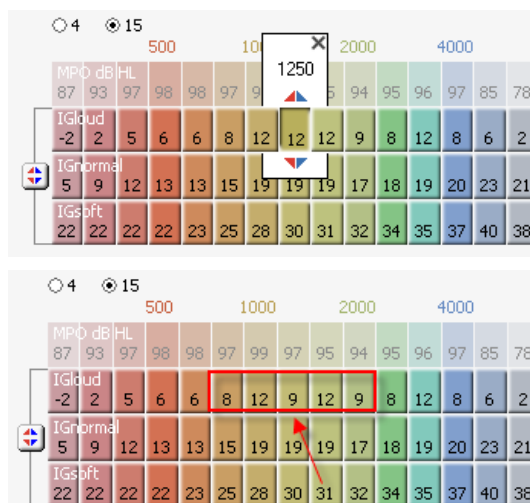
Fig. 11: Displays how gain can be adjusted in one single channel without influencing neighbouring channels.

Using the gain settings panel in Compass:
- The hearing care professional can choose between a basic gain settings panel with four channels and an expanded with 15 channels.
- Fine-tuning gain in the basic panel will allow for interpolation to neighbouring channels.
- Fine-tuning gain in the expanded panel allows for specific fine tuning in one channel only.

Allowing the hearing care professional to see how basic gain changes affect neighbouring channels

When using the basic gain settings panel with four channels, changes in gain in one of the four channels will influence neighbouring channels because of interpolation. This is reflected in the 15 channel panel and allows the hearing care professional to see how the gain changes affect neighbouring channels. see Fig. 12.
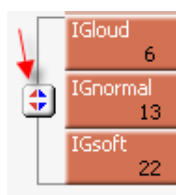
In both the basic and expanded panel it is possible to adjust one or more channels and input levels simultaneously. A new "Select all" function is available for adjusting the overall loudness. The function substitutes the previous "loudness master" function.

The 15 channel gain settings panel is complemented by the well known gain adjustment for soft sound and loud sounds.

Other options
Target gain

Target gain for the specific channel can be viewed using the Target icon. Targets are displayed for the specific program.

Fig. 13: Target gain shown in white numbers.

Undo/redo

Compass V5.1 introduces an undo/redo option. With this option the adjustments made in the gain settings panel can be undone. With the first adjustments in the panel the undo button will be active. And if an adjustment is undone, the redo button will become active.

Fig. 14: Undo and redo functions in the gain settings panel.
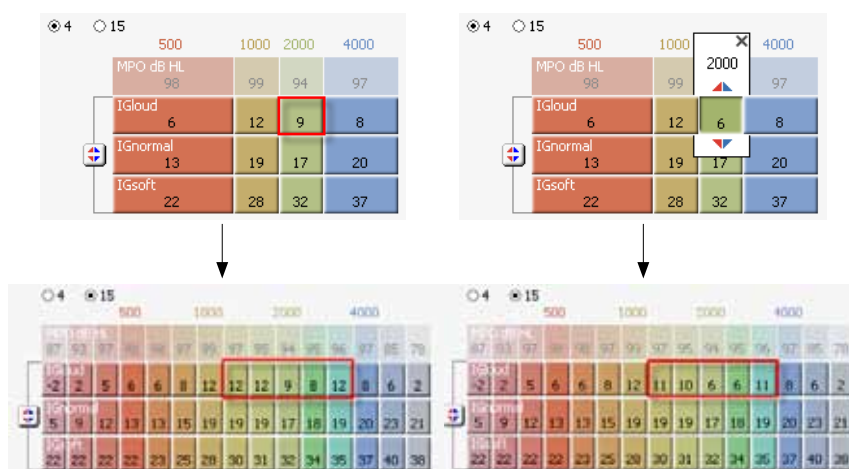
Fig. 12: Changes in gain made in the 4 channel matrix will be reflected in the 15 channel matrix because of extrapolation/interpolation.

THE **EXPANDED GAIN SETTINGS** PANEL IN **RELATION** TO THE **CLEARBAND HANDLE**

With the 15 channel gain settings panel, gain in the uppermost channels can be adjusted separately for both specific frequency regions and input levels. This gives the hearing care professional more opportunities when fine-tuning the very high frequencies in a ClearBand model.

When working with a ClearBand model, the ClearBand tool [icon] is still available, allowing the hearing care professional direct and quick control of the ClearBand range in terms of simultaneous adjustment of level for input in these high frequencies.

Fig. 15: The ClearBand tool is available in a ClearBand model.

The options in the 15 channel gain settings panel make it possible to adjust gain in discrete channels as well as for specific inputs.
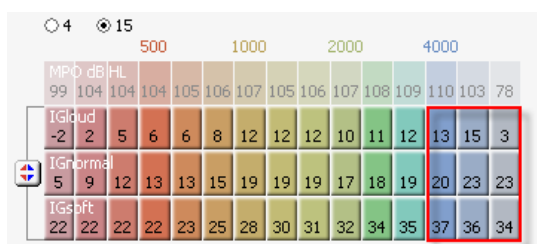
Fig. 16: Adjusting gain for specific frequency regions and input levels in the three upper channels in the hearing aid.

ACCLIMATISATION IN CLEAR440

The need for specific fine tuning of, for instance, gain settings is best established after the client has gone through an acclimatisation period. New hearing aid users often need to have gain settings for input and frequency levels that reflect their limited amount of experience with amplification. However, also experienced hearing aid users shifting from one hearing aid brand to another may find it difficult to tolerate the target gain for their hearing loss. For that reason, many hearing care professionals work with acclimatisation options in their fitting – either establishing an acclimatisation program or, if this is not an option, fine-tuning a master program to support the best possible acclimatisation. Widex high-end hearing aids have up till now offered the choice of an acclimatisation program with reduced gain in regard to frequency as well as input level.

With CLEAR440 the option to work with acclimatisation is further enhanced. With the introduction of a global acclimatisation strategy, the hearing care professional can choose to let acclimatisation be the basis for all listening programs. The acclimatisation strategy chosen still reflects gain adjustments in regard to both frequency and input level.

The Acclimatisation tool

The Acclimatisation tool found in the Gain settings panel in the Fine tuning window will adjust gain specifically for frequency and input levels to meet the acclimatisation requirements of, for instance, new users. The tool is by default ac-

tive only in the master program, reflecting the fact that adjustment of acclimatisation level will influence all programs in the hearing aid. See Fig. 17.

For specific handling of acclimatisation in a specific program such as a music program, this program must first be unlinked from the master program. The ability to unlink programs and work specifically with the acclimatisation level in a single program also helps the hearing care professional to create a specific acclimatisation program; a copy of the master program can be created and unlinked for specific adjustment of the acclimatisation level. See Fig. 18.

An acclimatisation level can be active for Master as well as for Music, TV, Comfort and Reverse focus. If you are working with compound programs, an acclimatisation level can be set individually for the part of the compound program with an acclimatisation level option.

Acclimatisation options in CLEAR440:
- The acclimatisation handle will apply acclimatisation globally across all programs.
- The acclimatisation handle can be accessed in individual programs by using the unlink function.
- A specific acclimatisation program can be created in an unlinked master2 program.
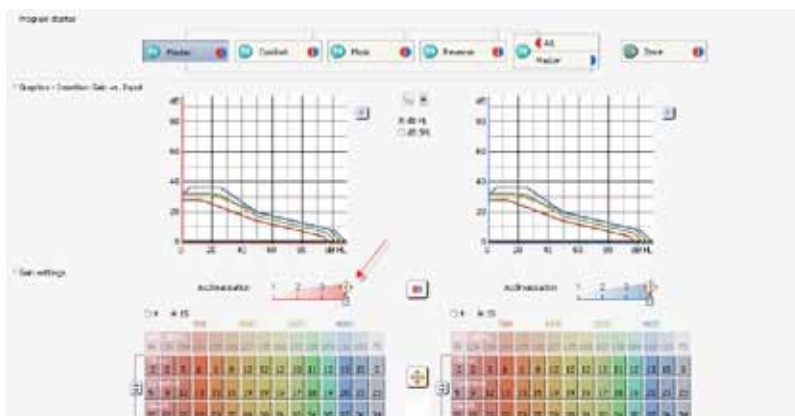
Fig. 17: Active acclimatisation handle in the master program.
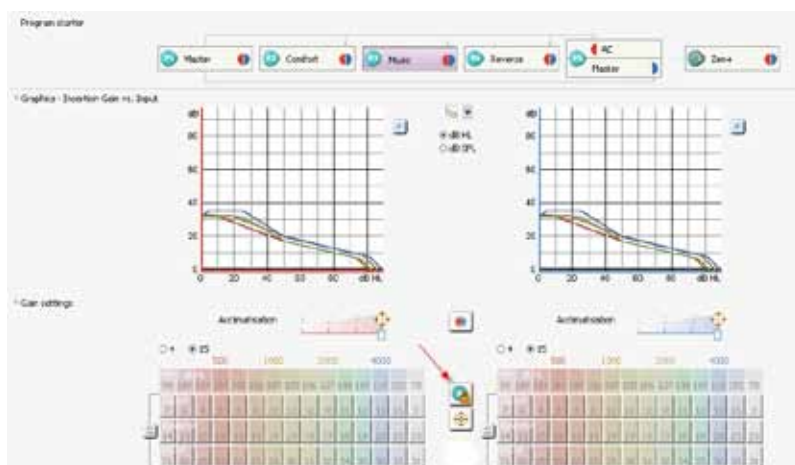
Fig. 18: Using the unlink function to activate the acclimatisation handle in other programs than master.

Applying acclimatisation

The acclimatisation handle shows that level 4 is the fully acclimatised fitting with prescribed gain for all input levels and frequencies. Choosing one of the lower acclimatisation levels results in an adjustment of gain for specific input levels and frequency areas. Gain is adjusted the most for the highest frequencies, a little less for mid frequencies and least for low frequencies. Soft sounds are the input levels most affected when choosing acclimatisation, normal sounds are less affected and loud sounds are only affected to a small degree.
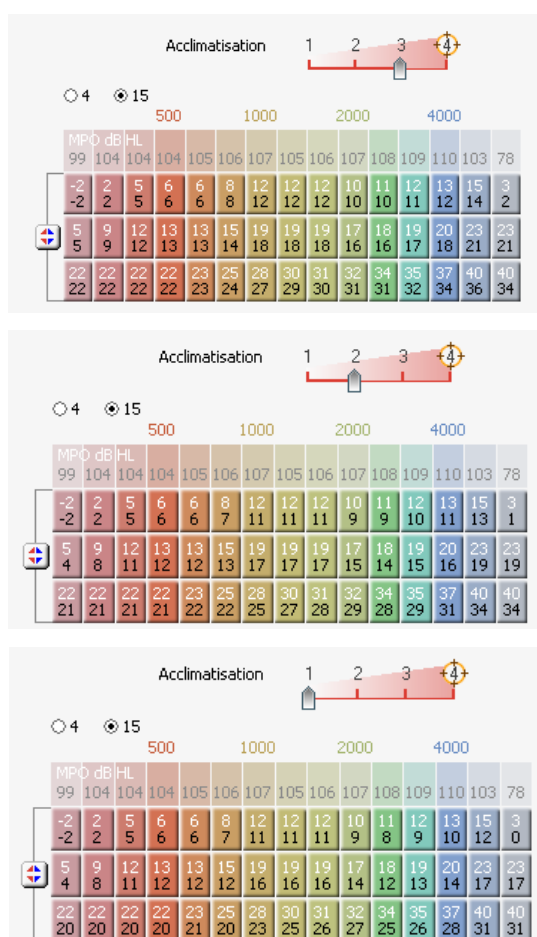
Fig. 19: Gain for the three different acclimatisation levels. Target gain is displayed in white.

NEW SOUND PROCESSING FEATURES IN CLEAR440 WARRANT NEW FINE-TUNING HANDLES

Fine-tuning ISP hearing aids has always included the option to work with microphone as well as speech and noise modes and feedback settings. This, of course, reflects the sound processing features found in ISP hearing aids. CLEAR440 features new advanced sound processing features and consequently new fine-tuning options.

The HD Locator

The HD Locator with Speech tracer found in ISP hearing aids provides a unique possibility of locating speech in noisy surroundings while maintaining audibility for soft sounds in quiet surroundings. The HD Locator works as an adaptive feature continuously adapting its workings to the surrounding environment. Maintaining a good signal-to-noise ratio in noisy surroundings while preserving audibility in quiet settings is the main target for the HD Locator.

It is well known that using BTE hearing aids has a negative effect on the ability to locate sounds coming directly from the front or back. Hearing aid users are often reported to confuse these two sound directions.

Sitting in a library trying to ascertain from which direction a sound is coming from can be difficult for users of BTE style hearing aids. Although audibility is preserved with the HD Locator with Speech tracer, the direction of a sound can still be hard to determine. This makes it difficult to direct the necessary degree of focus to the sound source. A teacher in a quiet classroom trying to deduce from where a request for help is coming could be another example. The reason for this difficulty is to be found in the implications of wearing a BTE hearing aid. The outer ear (pinna) helps a normal-hearing individual to localise a sound source in space. The shadowing effect of the pinna is most pronounced in the area from 2-5 kHz with an attenuation of approximately 3-4 dB for sounds coming from behind.

Utilising the matched microphone system of CLEAR440, the HD Locator now features a Digital Pinna mimicking the pinna effect of a normal-hearing listener. The electronic pinna characteristic found in the HD Locator secures optimal front/back localisation opportunities in quiet surroundings, while still allowing for the other main task of the HD Locator, namely to support the best possible signal-to-noise ratio in noisy surroundings.

Speech and noise modes

The Speech Enhancer has an InterEar functionality in a CLEAR440 fitting. With the WidexLink technology, two CLEAR440 hearing aids can exchange data. For the InterEar speech Enhancer this means that focus is directed towards the most dominant speaker in a noisy environment with more speakers. The InterEar functionality can be disabled using the InterEar configuration tool in HA configuration.

Fig. 20: The Pinna effect: The average shadow effect of the pinna. Sounds coming from behind are attenuated by 3-4 dB relative to sounds from the front.

The TruSound Softener – Impulse noise modes

Sudden sharp noises like the chink of porcelain or slamming doors present a specific challenge in hearing aid sound processing. Because of the abrupt and short lasting nature of these sounds, they may disturb and annoy the hearing aid user. Handling short and abrupt sounds warrants a specific mechanism able to detect such sounds and take immediate action. With CLEAR440 sound processing is enhanced with such a mechanism - The TruSound Softener. See Fig. 21.

Feedback cancelling modes

The Feedback cancelling mode options are SuperGain, SuperGain Max and SuperGain Music. The InterEar feedback system in CLEAR440 hearing aids enables the transmission of data on possible feedback between the two hearing aids. This allows for a more precise decision on whether or not there is feedback in the hearing aid in question. The feedback cancelling mode is still a choice between Super Gain (default), Super Gain Max and Super Gain Music.

The InterEar functionality of the feedback cancelling system can be disabled using the InterEar configuration tool in HA configuration.
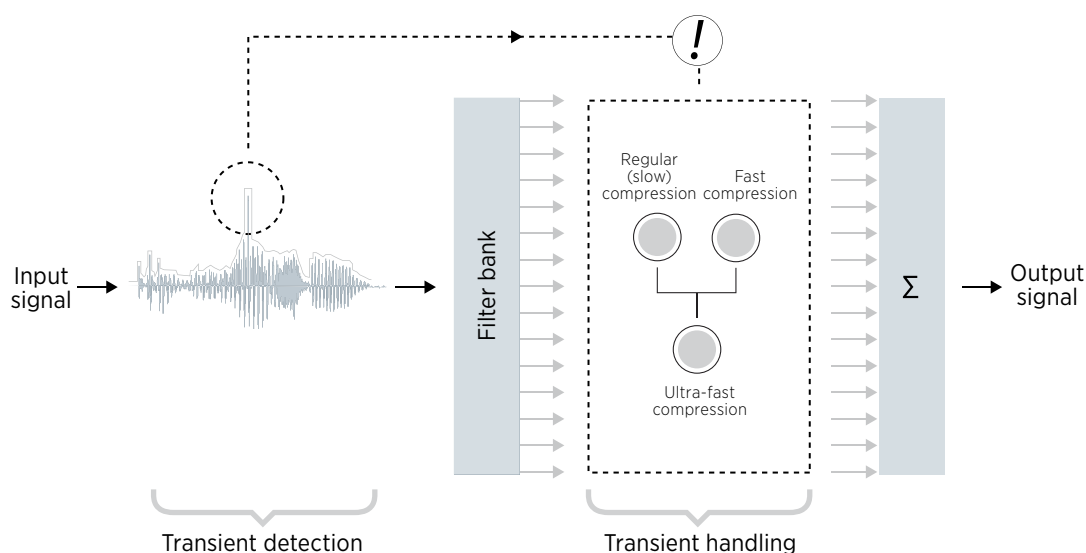
Fig. 21: Principle of the TruSound Softener.

CHOOSING DIFFERENT MODES IN FEATURE SETTINGS

The speech and noise modes and the feedback cancelling modes have an InterEar functionality – indicated by the InterEar icon on the screen. This icon indicates that the feature can work with InterEar functionality regardless of whether the InterEar coordination is turned on or off in the fitting. In a monaural fitting, this icon will still indicate the ability of this feature to be InterEar in binaural fittings. See Fig. 22.

Microphone modes

In a default fitting, the microphone mode chosen is HD locator with Digital Pinna in most listening programs. The HD Locator features, as an inherent component, the Speech tracer and now also the Digital Pinna supporting the ability to tell whether sounds are coming from the front or back.
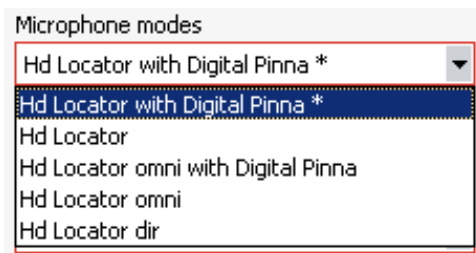
Fig. 23: The different options in Microphone modes.

There are five different microphone modes; the two adaptive modes are HD Locator with or without Digital Pinna, and the three fixed modes are HD Locator omni with or without Digital Pinna and HD Locator dir.

HD Locator omni and HD Locator dir are mainly for demonstration purposes, although HD Locator omni is the default setting for the music program. They both reflect a fixed setting of the microphones, supporting either a full omni mode that does not support a good signal-to-noise ratio, or a fixed directional system which compared to HD Locator will support a poorer signal-to-noise ratio when speech originates from behind the user.

The HD Locator omni with Digital Pinna is a choice for the user who is often in a quiet environment where he has to locate sudden sounds – for instance a librarian. It is not chosen as the default setting by any program, but could be used when creating a listening program for such a user.

> **HD Locator with Digital Pinna** – supports localisation in quiet environments (classroom, library) and ensures best possible signal-to-noise ratio in noise.
>
> **HD Locator** - supports full audibility in quiet and optimal signal-to-noise ratio in noise – useful when full audibility is necessary in quiet.
>
> **HD Locator omni with Digital Pinna** - supports permanent ability to localise sound in quiet (in a quiet environment like a library)
>
> **HD Locator omni** - primarily used for demonstration purposes. Used as the default setting in the music program.
>
> **HD Locator dir** - primarily used for demonstration purposes.

Fig. 22: Feature settings displaying the ability for speech and noise modes and feedback cancelling modes to have an InterEar functionality.
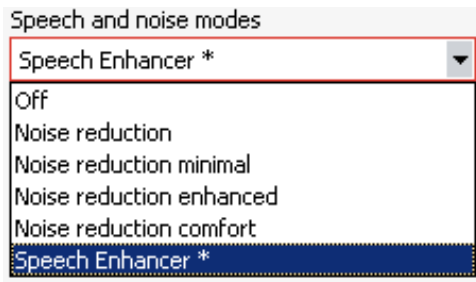
Speech and noise modes

Fig. 24: The different options in Speech and noise modes.

The Speech and noise modes menu lets you choose between the SIS based noise reduction or the SII based Speech Enhancer, the Speech Enhancer being the default choice for the master program. The Speech Enhancer has the ability to work with InterEar functionality.

Impulse sound modes

Fig. 25: The different options in Impulse sound modes.

With CLEAR440, the Impulse sound modes are introduced. The TruSound Softener detects and handles impulse sounds for the comfort of the user. It is active by default in the fitting. In a comfort program the TruSound Softener Plus on mode is active to provide a higher degree of dampening of impulse sounds. This setting can also be chosen for the master program for clients who are extra sensitive to impulse sounds. For the music program, the default setting of the TruSound Softener is off - since music will include impulse sounds that should not necessarily be dampened by the hearing aid.

The Speech Enhancer has InterEar functionality and is based on the Speech Intelligibility Index (SII) for best possible speech intelligibility.

The noise reduction modes – the Speech Intensification System (SIS) – ensure good quality noise reduction when speech intelligibility is not the main purpose.

The TruSound Softener detects and handles impulse sounds.

By default on in all acoustic programs except for the music program.

TruSound Softener Plus on can be chosen for extra sound sensitive clients.
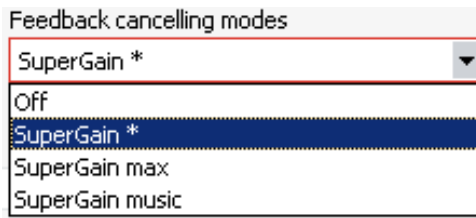

Feedback cancelling modes

Fig. 26: The different options in Feedback cancelling modes.

The Feedback cancelling modes menu allows you to choose between different feedback cancelling options. Different programs will display different default feedback cancelling modes. For example, the music program features SuperGain music as default mode since this mode is especially designed for listening to music.

> The feedback cancelling modes have InterEar functionality allowing for a more precise decision on feedback occurrence.
>
> **SuperGain** allows as much gain possible without feedback.
>
> **SuperGain max** will allow extra gain, introducing a higher risk of feedback.
>
> **SuperGain music** is designed specifically for listening to music in a stable environment.

Fine-tuning Feature settings

The default feature settings in a CLEAR440 fitting reflect the general perspective and vision with the CLEAR440 aids: to allow InterEar coordination and synchronisation of relevant hearing aid features to support the perception of natural sound. During fine tuning, the hearing care professional can, of course, choose to offer the client other feature settings than the default settings proposed by Compass, for instance by choosing Classic noise reduction modes or other Locator settings etc.

Also the feature settings can be changed independently for each ear by disabling Binaural adjust. We do not recommend to choose different feature settings in a binaural fitting since this might undermine the intentions of the coordinated features in a CLEAR440 fitting.

Choosing two different speech and noise modes like Speech Enhancer and Noise reduction, for example, will counteract the intentions of the InterEar Speech Enhancer working to preserve the client's ability to focus on a dominant speaker.

> Binaural adjust can be disabled for monaural adjustment of left and right hearing aid individually.
>
> Disabling Binaural adjust may affect the intentions of the InterEar functionality in the fitting.

CHAPTER 3:
NEW PROGRAM OPTIONS WITH CLEAR440

NEW PROGRAMS OFFERING A SOLUTION TO MORE LISTENING SITUATIONS

Using hearing aids with multiple programs will always include the risk of the user getting out of sync with the program choices. Trying to balance the sound on two hearing aids that by error operates in two different programs will, of course, be difficult. Clients will experience a disturbed and out of balance sound picture. Sometimes, the user may want to use different program settings on the two hearing aids – think of the client watching TV with his wife, only switching one hearing aid to Tele and leaving the other in the Master program for better perception of the surroundings.

CLEAR440 features a range of new possibilities in meeting client wishes in terms of special listening programs. With the development of the WidexLink technology used in CLEAR440, program handling is synchronised to give the client easier control over program selection. Using the program button on one hearing aid or a dedicated remote control – RC-DEX or M-DEX – the default program handling setting will permit the user to change programs in both hearing aids at the same time. Together with the SmartSpeak or SmartTone features, this further helps eliminate the confusion some hearing aid users experience when handling their hearing aids.

New programs

For those situations where clients need to have different settings of the hearing aid programs – like the TV situation mentioned earlier, or if the client wants to have Zen in one hearing aid and Master in the other while concentrating on a task at work, CLEAR440 features a range of compound programs. These compound programs were developed to reflect the most frequent usage of un-synchronised programs in hearing aids.

When compound programs are activated by the client, the InterEar functionality of compression and noise reduction is not active. The IE Feedback cancelling will still be active reflecting the fact that the InterEar exchange of data relevant to assess the origin of a feedback like signal is still relevant. Also the InterEar volume and program control will still be active.

The compound programs are designed very specifically for listening situations where the focus of the user is not on a natural listening experience, but on meeting a specific need. Therefore the InterEar Speech Enhancer and InterEar TruSound compression are not active in compound programs.

In situations like driving a car and listening to a backseat passenger or sitting in a wheel chair listening to a caretaker behind the wheel chair, hearing impaired individuals will often find it difficult to achieve the right amount of focus.

A new listening program - the Reverse focus program helps solve the difficult task of listening exclusively in the reverse direction. In this program, the hearing aids will effectively reverse the Locator pattern to achieve optimum focus on sounds from behind. KEMAR measurements done at the Widex laboratories suggest a 5 dB improvement in the signal-to-noise ratio for sounds coming from behind. The Reverse focus program is available both as a normal program synchronised between the two hearing aids and as part of a compound program with Master in the other ear.

With M-DEX, the Free-Focus option is available. This option allows the hearing aid user to choose between four listening directions; front, back, right or left.

FreeFocus is not a program that can be accessed or chosen through Compass. FreeFocus is based on the Master program and is influenced by adjustments made in this program.

The Program manager

The Program manager lets you choose programs for the client. The Program manager will allow you to choose between a list of normal programs as well as a list of predefined compound programs. See Fig. 27.

Fig. 27: The Program manager with normal and compound programs.

The programs chosen will be displayed in the Program starter in the Fine tuning window. Note program 5 - a compound program with Audibility Extender in the right–ear hearing aid and Master in the left. The Program starter panel also displays how the different programs are linked to the master program. See Fig. 28.

Fine-tuning specific programs

When activating a specific program in the Program starter, this program can be fine-tuned when unlinked from the master program.

When fine-tuning a compound program, each of the two programs is fine-tuned separately. If fine tuning of a compound program is necessary, the program needs to be activated in the Program starter and unlinked from the master program. See Fig. 29 and Fig. 30.

- CLEAR440 offers new programs.
- The Program manager is divided into normal programs and compound programs: a list of pre-defined program packages.
- Using the Program starter all programs can be specifically fine-tuned.

Fig. 28: The Program starter displaying normal and compound programs.
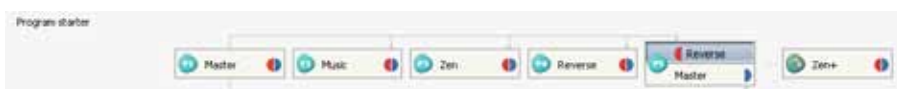

Fig. 29: Choosing the right hearing aid with the Reverse focus program for fine tuning.

Fig. 30: Unlinking from the master program to allow fine tuning.

A refined Zen option

IE Zen is a refinement of our proven Zen feature. With the ability to exchange information over the WidexLink, the playing of tones in the Zen styles can be coordinated – offering the user a stereo-like effect when listening to Zen.

Zen is intended to be used for relaxation and concentration purposes and experience has shown us that Zen is well accepted as a tool that can help end users relax and concentrate. With CLEAR440, the user is now also offered a noise style, introducing broadband noise as an option for situations where Zen is applied specifically for diverting attention from other disturbing sounds.

Furthermore, noise can be added to the five musical Zen styles. See Fig. 31.

With CLEAR440, the Zen styles can be fine-tuned in terms of pitch, tempo and volume. It can also be specified whether they should be played with or without sounds from the microphones. It is also possible to define a limited play time, meaning that the Zen styles will stop playing after a defined period of time.

Zen can be activated as a program in the normal program stack and/or as a Zen+ option accessed with a long key press on the hearing aid program button or RC-DEX.

When activating Zen+, the default styles are aqua, coral and green. Experience and field studies with Zen have shown that these are the three styles receiving the highest rating when judged for relaxation purposes. See Fig. 32.
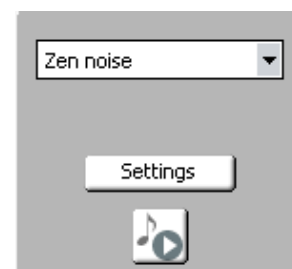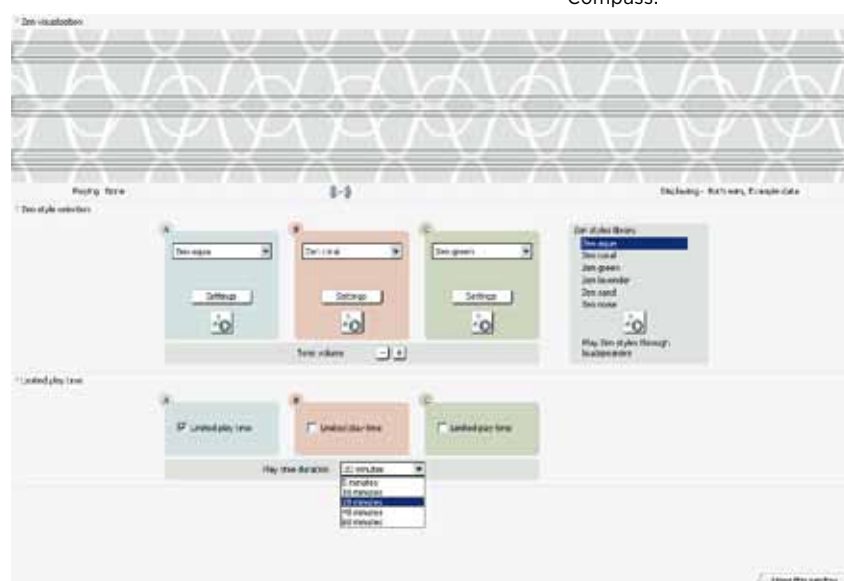

Fig. 31: Zen noise chosen in Compass.

Fig. 32: Zen+ with the three default styles and limited play time defined as 20 minutes for Zen Aqua.

Fine-tuning Zen

When changing to the Zen program using the Program starter in the Fine tuning window, the Zen tones will not play immediately, allowing the hearing care professional time to talk with his client and explain the fine-tuning options without possible interference from the Zen tones. The chosen Zen style is activated using the play button in the Fine tuning window. While playing the style, it is possible to adjust tempo, pitch and volume by entering the settings option. Under settings it can also be decided whether the microphone sound should be on with the Zen style and, for a musical Zen style, whether a broadband noise should also be played. See Fig. 33.

Binaural adjust can be disabled for monaural adjustment of the left and right hearing aid. We do not recommend disabling the binaural adjust feature when fine-tuning Zen, since it could possibly affect the intentions of the InterEar functionality.

Fine-tuning Zen step by step:
- Choose the Zen program or the Zen+ program in the Program starter.
- Talk to the client about the possible fine-tuning options.
- Activate a Zen style by using the play button.
- Let the user listen to the chosen Zen style to evaluate it.
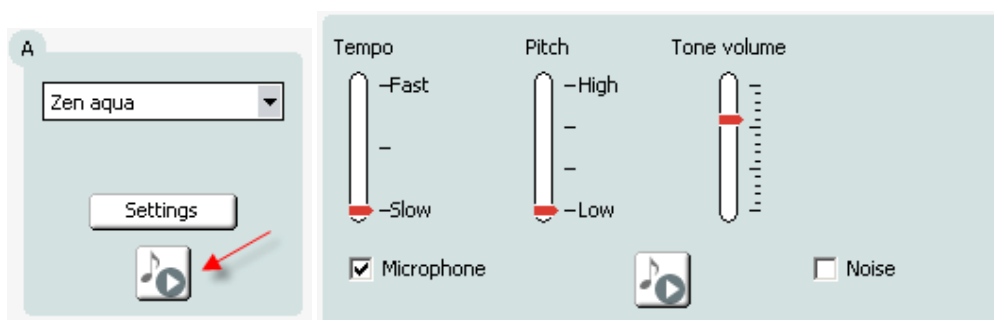- Fine-tune the chosen Zen style if necessary by entering Settings.

Fig. 33: Activating Zen and adjusting tempo, pitch and tone volume for a style.

PROGRAM **OPTIONS** IN CLEAR440

TYPE	PROGRAM	DESCRIPTION
Normal - Acoustic		
	Master	Best possible overall performance in all environments. • IE TruSound compression • HD Locator with Digital Pinna • IE Speech Enhancer • TruSound Softener on • IE feedback cancelling SuperGain
	Music	Optimised for reproduction of live or recorded music. Emphasises low frequencies. • IE TruSound compression • HD Locator omni • Noise reduction off • TruSound Softener off • IE feedback cancelling SuperGain music
	TV	Optimised for reproduction of television sound. Emphasises high frequencies and attenuates low frequencies. • IE TruSound compression • HD Locator with Digital Pinna • IE Speech Enhancer • TruSound Softener on • IE feedback cancelling SuperGain max
	Comfort	Optimum comfort in noisy as well as quiet environments when speech is not essential. Higher knee point for soft sounds. • IE TruSound compression • HD Locator with Digital Pinna • Noise reduction comfort • TruSound Softener Plus on • IE feedback cancelling SuperGain
	Reverse Focus	A program dedicated to focusing on sounds from behind. • IE TruSound compression • HD Locator reverse • IE Speech Enhancer • TruSound Softener on • IE feedback cancelling SuperGain
	Audibility Extender	Transposes high frequency sounds into the audible frequency range. • HD Locator with Digital Pinna • Noise reduction • TruSound Softener off • IE feedback cancelling SuperGain
	Phone	Gives the optimum reproduction of sound during a phone conversation

TYPE	PROGRAM	DESCRIPTION
Normal - Telecoil		
	T	Focuses on the input from the telecoil.
	MT	An acoustic program combined with input from the telecoil.
Audio Transmission		
	Phone+	Provides optimum intelligibility of a phone conversation by allowing both ears access to the signal.
Sound input program		
	Zen	Randomly plays smooth and harmonic sounds to remove the user's focus from background noise. The sounds are distributed over two hearing aids in a binaural fitting for a stereo-like experience.
	Zen+	Program set with three individual sound styles. Randomly plays smooth and harmonic sounds to remove the user's focus from background noise. The sounds are distributed over two hearing aids in a binaural fitting for a stereo experience.
Compound		**Two different programs in the two ears**
	T/Master	Right/left or left/right
	MT/Master	Right/left or left/right
	Audibility Extender/Master	Right/left or left/right
	Zen/Master	Right/left or left/right
	Reverse Focus/Master	Right/left or left/right
	Phone/Master	Right/left or left/right

Table 1: Program options in CLEAR440.

CHAPTER 4: ADDITIONAL OPTIONS WHEN FITTING CLEAR440

DEFINABLE VOLUME CONTROL

Many clients enjoy the option of a volume control to adjust the volume of the hearing aid in specific situations. Fitting a hearing aid with a volume control option or using a matched RC-DEX allows the client the option of adjusting volume.

In a default fitting, the volume can be adjusted in 1.5 dB steps in the range of +6 dB to -12 dB.

Fig. 34: Volume bar with a default step size of 1.5 dB.

Some clients adapt to the step size of the volume control very easily while others prefer different step sizes. Some users prefer fast volume adjustment and others prefer a smaller step size for more discrete tuning of the volume. For this reason, CLEAR440 features the option of adjusting the volume in both larger and smaller increments. See Fig. 35.

The number of steps available depends on the size of these.

Fig. 35: The volume control step size can be changed under User Controls in the HA configuration window under Finalise.

SOLUTION **GUIDE**

With Compass V5 the Solution guide has been refined and new functions implemented.

Program specific Solution guide
It is still possible to find advice about how to adjust each program in the Program specific Solution guide. Here you find solutions for all programs in CLEAR440.

Undo
⟲ The Solution guide offers a 'sequential' undo function, meaning that the hearing care professional can undo the last solution he has made.

Select topic
In the Solution guide a new category under Identify problem has been added and the three categories are: 1. Select topic. 2. Select category. 3. Specify complaint. See Fig. 36.

The hearing care professional follows the wizard in the Solution Guide as usual and finds a more detailed fine-tuning description with a client specific solution. The Solution guide indicates by a green check mark if a solution has been applied. Please be aware that the check mark becomes grey if you undo the solution. See Fig. 37.

Fig. 36: The three categories in the Solution Guide.

Fig. 37: In the Solution Guide you find a fine-tuning description with a client specific solution.

PAIRING/UNPAIRING CLEAR440 HEARING AIDS

It is well known that a binaural fitting of hearing aids is the best way to target the difficulties faced with a binaural hearing loss. With the new InterEar features in CLEAR440, fitting two hearing aids, when possible, will offer the client even more features to help overcome his daily challenges.

When fitting a pair of CLEAR440 hearing aids, the aids are paired in a number of ways allowing for best possible use of and benefit from the InterEar functionalities offered. The default fitting allows the synchronisation of program and volume control as well as InterEar functionalities in noise reduction, compression and feedback cancelling.

Unpairing CLEAR440

In some situations though, a hearing aid user may decide not to continue with the binaural solution, for example because of inability to acclimatise to the binaural fitting, the cost of buying two hearing aids or lack of acceptance of wearing two hearing aids. Also some users prefer to have two hearing aids, but only wear them one at a time.

When such a client returns to the hearing care professional, the professional can decide to go online with just one of the aids to make further adjustments while leaving the other aid unadjusted or maybe returned to the clinic.

Compass ensures that the hearing care professional is prompted on the decisions necessary to make online adjustments to one hearing aid belonging to a pair. See Fig. 38.

The hearing care professional may decide to use hearing aid data, which allows him to keep all original data from the first fitting, i.e. programs, fine tuning etc. In the case of using Compass data, a new fitting is started based on a monaural rationale. See Fig. 39.

Continuing the monaural fitting will prompt the hearing care professional that the InterEar functionalities will no longer be active in the fitting. If the two hearing aids are connected simultaneously again later, Compass will automatically reestablish the pairing.
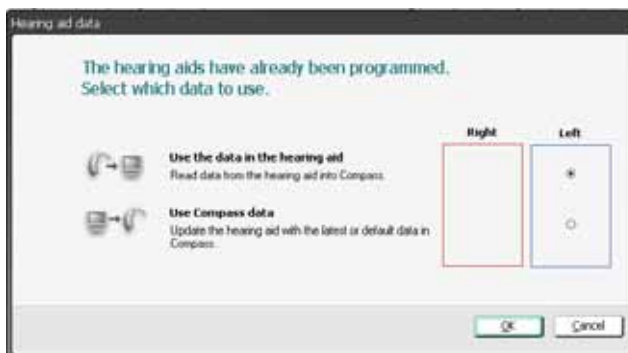

Fig. 38: Dialogue when online with one hearing aid of an original pair.

Fig. 39: The hearing care professional is advised that the hearing aid is one of a pair and that continuing will mean that all syncronisation between the aids will be switched off.

Pairing CLEAR440

In situations where a client has had a pair of hearing aids unpaired or have only been fitted monaurally from the beginning, going online with two CLEAR440 hearing aids simultaneously will allow the hearing care professional to choose whether to use hearing aid data or Compass data. See Fig. 40.

To continue a fitting based on hearing aid data, the data in the two hearing aids must match so that relevant features can be synchronised and coordinated. Compass informs the hearing care professional of the points where the two hearing aids do not match and prompts him to make a decision on which settings to use. See Fig. 41 and Fig. 42.
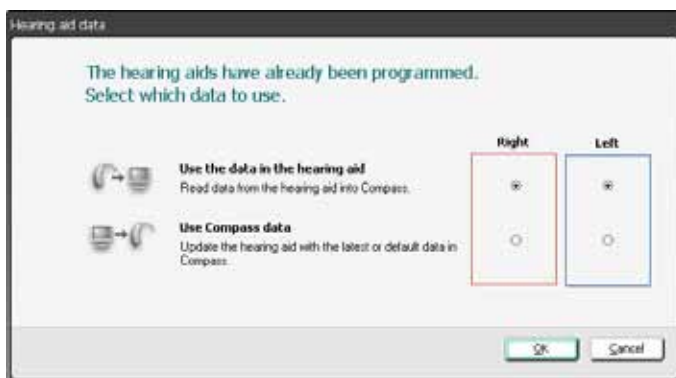

Fig. 40: Choosing either hearing aid data or Compass data for the continued fitting.

Fig. 41: The volume step size differs in the two hearing aids. The hearing care professional can choose which step size to use.

Fig. 42: The program settings differ in the two hearing aids. A choice of using either left or right settings is given.

Service Reminder

The Service Reminder is a message played in the user's hearing aid to remind him about making a new appointment at the hearing care professional. The Service Reminder is an optional function activated in Compass. See Fig.43.

In the drop-down menu it is possible to choose a time interval for when the Service Reminder should be played. When the hearing care professional chooses a time interval, a dialogue box appears. See Fig. 44.

Please be aware that Compass automatically resets the Service Reminder when connecting a hearing aid. The hearing care professional has to activate the Service Reminder each time during a visit to ensure the right time interval till the next visit.
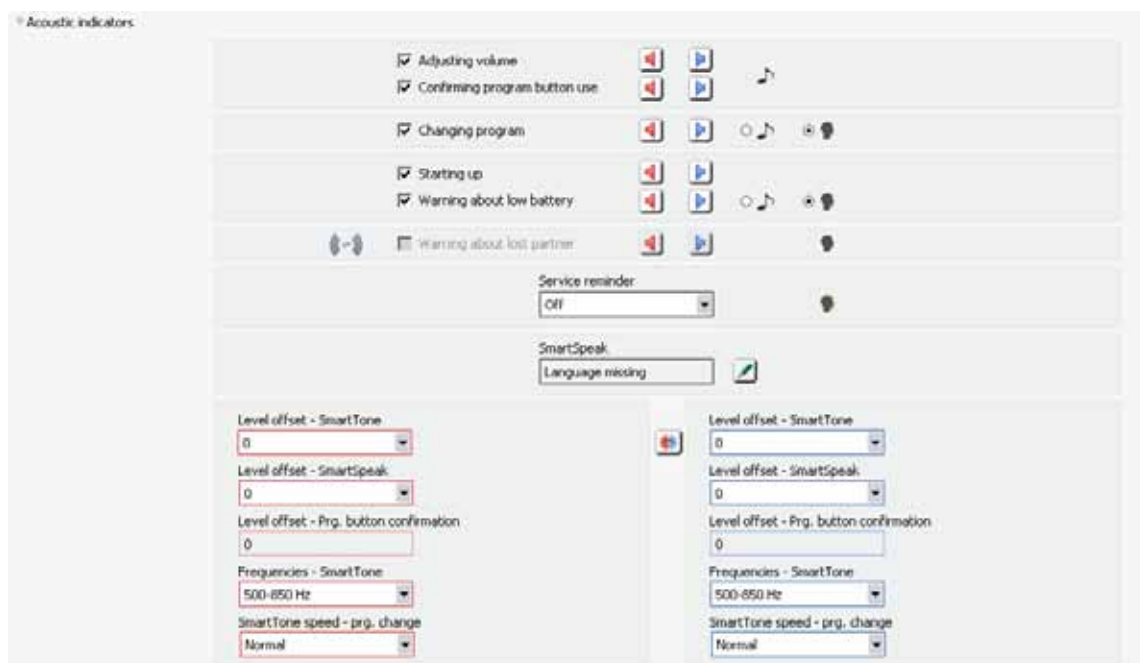

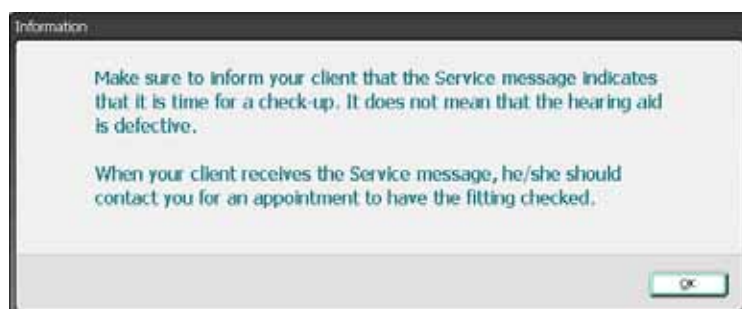Fig. 43: The Service Reminder function is activated in Compass under Finalise and HA configuration.

Fig. 44: This dialogue box appears when the hearing care professional chooses a time interval.

SAFETY CODE

Some hearing care professionals have asked for a Safety code to ensure that data from a fitted hearing aid is not accessible to others.

The Safety code ensures that if the hearing aid is connected to another fitting system, a code must be entered. Otherwise, it is not possible to open the fitting and work with the hearing aid data. See Fig. 45.

The code automatically expires when the expiration date defined is reached. After this date, no code is necessary to fit or fine-tune the hearing aid.

Fig. 45: The Safety code panel is, by default, closed when you open the Close window. You can open the panel and use it to define a safety code for the hearing aid.

CHAPTER 5: **RATIONALE CHANGES AFFECTING THE FITTING**

AISA III

Efforts are constantly made to ensure that AISA provides the most accurate picture of the in-situ acoustics possible in every situation. The possibilities offered by AISA in terms of ensuring precise gain prescription will be explored to the widest possible extent in CLEAR440 for even further precision in fitting.

Sound Harmony in Flex Fittings
AISA III now also offers Sound Harmony for flex (i.e., ventilated) fittings in CLEAR440.

Originally introduced in connection with open fittings, Sound Harmony minimises uncertainties with respect to how much gain is given.

With a completely closed earmould, there is no vent through which external sound can leak in. This is not the case with ventilated fittings, however. With a flex fitting there will always be a certain amount of directly transmitted sound leaking in through the vent.

If the directly transmitted sound is more or less equal in level with the hearing aid sound at low frequencies, this may lead to uncertainties with respect to how much gain is actually applied at the eardrum.

These uncertainties are handled by means of Sound Harmony. Sound Harmony makes sure that gain application is always under control by making bands transparent when the directly transmitted sound and the hearing aid sound are on competing levels.

Band transparency in flex fittings
In open fittings, the three lowest bands (125, 250, 350 Hz) are made transparent by default by the system. In flex fittings, on the other hand, the three lowest bands may be made transparent by the system if specified by the rationale, but they are not transparent by default. See Fig. 46.

Minor adjustments in rationale
A few minor adjustments have been made in the rationale in connection with CLEAR440. In practical terms, this may lead to fewer instances of band transparency and slightly different Insertion Gain values for open fittings than you would see with, for instance, a mind440 hearing aid.

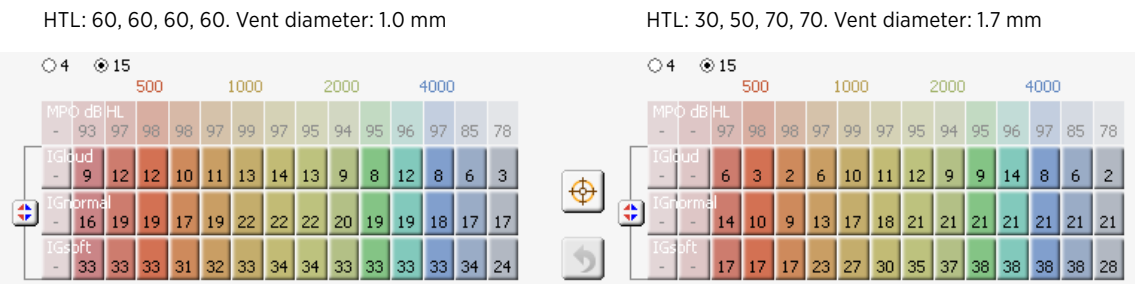HTL: 60, 60, 60, 60. Vent diameter: 1.0 mm   HTL: 30, 50, 70, 70. Vent diameter: 1.7 mm

Fig. 46: Band transparency varies with hearing loss configuration and vent diameter. We can see that only the lowest band is transparent in the left panel (flat hearing loss, 1 mm vent) while two bands are transparent in the right panel (sloping hearing loss, 1.7 mm vent).